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AGRARIAN STRESS AND CLIMATE CHANGE IN THE EASTERN GANGETIC PLAINS: GENDERED VULNERABILITY IN A STRATIFIED SOCIAL FORMATION

Fraser Sugden, Niki Maskey, Floriane Clement, Vidya Ramesh, Anil Philip, Ashok Rai

ABSTRACT

This paper reviews the complex impact of climate change on gender relations and associated vulnerability on the Eastern Gangetic plains of Nepal and India. Field research has identified that gendered vulnerability to climate change is intricately connected to local and macro level political economic processes. Rather than being a single driver of change, climate is one among several stresses on agriculture, alongside a broader set of non-climatic processes. While these pressures are linked to large scale political-economic processes, the response on the ground is mediated by the local level relations of class and caste, creating stratified patterns of vulnerability. The primary form of gendered vulnerability in the context of agrarian stress emerges from male out-migration, which has affected the distribution of labour and resources. While migration occurs amongst all socio-economic groups, women from marginal farmer and tenant households are most vulnerable. While the causes of migration are only indirectly associated with climate change, migration itself is rendering women who are left behind from marginal households, more vulnerable to ecological shocks such as droughts due to the sporadic flow of income and their reduced capacity for investment in off-farm activities. It is clear that policies and initiatives to address climate change in stratified social formations such as the Eastern Gangetic plains, will be ineffective without addressing the deeper structural intersections between class, caste and gender.

Keywords: Climate change, Vulnerability, Eastern Gangetic Plains, Gender, Class, Caste

1. INTRODUCTION

There is a growing literature on gender and vulnerability to climate change, yet the complexities of climate change impact and the intersectionality of gendered vulnerability are yet to be fully understood. Based upon a series of three case studies in the eastern Gangetic Plains in Nepal and India, this paper contributes to scholarship on vulnerability by understanding the social impact of climate change not in isolation, but as a 'conjuncture' or combination of circumstances, on an ecological, economic and political level. It is shown that climate is one of a number of stresses on agriculture, alongside a series of multi-scalar political economic processes. Furthermore, some of the most significant gendered patterns of vulnerability evidenced in this study are not directly but *indirectly* related to climate – particularly as climatic and non-climatic factors drive male out-migration and transform the household economy. In this context, a significant finding is that these patterns of gendered vulnerability are developed along class lines, a process which is all the more crucial to acknowledge in the deeply stratified social formation of the eastern Gangetic Plains. This has significant implications for public climate change adaptation policies in Nepal, which currently tend to focus on climate change in isolation to other stresses and portray women's vulnerability as resulting from proximate causes such as poverty rather than underlying structural factors.

2. UNDERSTANDING CLIMATE CHANGE, GENDER AND VULNERABILITY

The concept of vulnerability has multiple definitions, but in general it refers to 'the extent to which a system or population is susceptible to harm' (Adger, 2006, 268), and research on the topic aims to identify means

through which wellbeing can be enhanced through reducing risk and promoting resilience (Adger, 2006). Ribot (2010) notes how vulnerability analyses are usually lumped into two broad approaches: the risk-hazard and social constructivist frameworks. The Risk-Hazard (or natural hazard) approach tends to understand vulnerability as multiple outcomes of one biophysical event (as an impact analysis), as a “dose-response relation between an exogenous hazard to a system and its adverse effects” (Füssel and Klein, 2006, 305). This largely depoliticised approach remains dominant in contemporary policy discourse on climate change adaptation (Bassett and Fogelman, 2013).

The social constructivist or political economy approach, which this paper will broadly adopt, seeks to explain vulnerability as due to multiple causes rooted in social structures (Füssel, 2007). Within this approach are a range of frameworks. Dreze and Sen (1991) analyse how the vulnerability of individuals and social groups is shaped by ‘entitlements’, the rights and opportunities people own or claim to command over different commodity bundles. As individuals and social groups have different entitlements depending on their age, caste, class, gender, ethnicity, or religion, vulnerability is shaped by social factors. Similarly, Watts’ (1983) research from Nigeria in the 1970s examined how the social impact of hazards and adaptive capacity is intricately connected to local level relations of production, which are in turn connected to the unequal dynamics of the global capitalist economy. These frameworks trace the broader political-economic structures which enable some but not others to access assets and services, allowing one to understand vulnerability beyond its proximate causes (Ribot, 2010).

Despite its theoretical importance, the political economic approach to vulnerability and resilience remains marginal within debates on climate change today (Bassett and Fogelman, 2013). There is however, a growing body of related scholarship exploring how gender shapes vulnerabilities and adaptation. The most notable contribution on this topic stems from the disaster and gender and development field which have explored the impact of natural disasters on health and livelihoods. These studies have emphasised that women are usually disproportionately hit by extreme climatic events (Neumayer and Plumper, 2007). Natural disasters have both an immediate direct effect on women during the event and an indirect effect through a change in gender relationships under distressed conditions. Women’s higher vulnerability has been attributed both to their (lack of) access to certain assets and to social norms determining their mobility and behaviour (Neumayer and Plumper, 2007, Sultana, 2013, Shah et al., 2013). Such disparities are particularly prominent in the Eastern Gangetic Plains, a region characterised by a highly patriarchal society and strong gender norms. In both the Nepal Tarai and Bangladesh, flood-related fatalities were found to be higher for women than men (Bartlett, 2008, World Bank, 2010). Suggested structural factors for women to be more vulnerable identified from Bangladesh include social norms which cause women to leave the homestead last (Nelson et al., 2002, Dasgupta et al., 2010) and discourage them from entering public shelters with strangers (Climate Change Cell, 2006). Pre-existing girls’ vulnerability to shocks due to a systematic lower access to education and higher malnutrition rate also makes them more vulnerable than boys to natural disasters (Sultana, 2013).

In a broader literature on the impact of climatic variability, women have often been portrayed as more vulnerable to climate change because of their higher dependence on natural resources and higher poverty rate (Mainlay and Tan, 2012). Women’s vulnerability has increased when access to resources and income derived from key livelihood activities in the ‘female’ domain are disproportionately affected by a changing climate. A prominent example is how a change in water availability affects women’s workload. For instance, the disruption of fresh water sources following saline intrusion in the Ganges delta has affected a large proportion of women, who are obliged to travel longer distances to provide drinking water for their families (WEDO, 2008). Again in Bangladesh, increased water logging has also been shown to raise the work burden for many women, as they take responsibility for much of the relocation work (Climate Change Cell, 2006).

These simplistic and polarised representations of men and women in the face of climate change are however, problematic. Studies drawing from feminist political ecology (e.g. Demetriades and Esplen, 2008; Mitchell et

al., 2007; and Nelson and Stathers, 2009) have shown that how men and women are affected by natural disasters and environmental stress is highly dependent on the social context, including other divisions such as class, caste, age and ethnicity (Sultana, 2013, Arora-Jonsson, 2011). However mainstream discourses on gender and vulnerability to climate change have failed to engage with the broader political economy. Presenting women as passive victims of climatic variability and climatic hazards holds the risk of wrongly diagnosing the causes of vulnerability (Arora-Jonsson, 2011). A sound analysis of gendered vulnerability to climate change requires one to go beyond the description of how men and women are affected differently, and requires analysis of the underlying structural causes of vulnerability that mediate access to resources.

3. NEW DIRECTIONS IN VULNERABILITY RESEARCH

There are a number of areas where the emerging scholarship on the political economy of vulnerability, gender and social differentiation in the context of climate change can be expanded. Firstly, as noted above, it is crucial to combine research on gendered vulnerability to climate change with the analysis of other axes of inequality. Women or men cannot be understood as singular categories, but are divided according to their position in the agrarian structure. The intersection between gender and socio-economic status has been acknowledged in past research (O'Hare, 2001, Ahmad, 2012, Sultana, 2009). However, there is a need to make class and caste more central to understanding gender differences in climate change vulnerability and adaptation, while also engaging with the broader political-economic relations which reproduce these larger social structures.

Furthermore, it is important to note that the impact of climate change is not always direct. The process of adaptation itself can disrupt the household economy, and this is beginning to receive attention in the literature. This is most relevant with respects to climate induced migration (Ansorg and Donnelly, 2008, WEN, 2010), which not only creates new forms of vulnerability for migrants who are usually male, but for those left behind, who are often women. These include higher workloads, difficulties accessing state services, and challenges ensuring the safety and welfare of the family (Zahur, 2009, Sultana, 2013). This can be considered an *indirect* form of vulnerability to climate change.

This however, raises a final issue, which has received little attention in the literature: the actual role of climate as a driver of livelihood change. Mortreux and Barnett's (2009) study from Tuvalu challenges dominant discourses of 'climate refugees', showing how decisions to leave the islands are primarily linked to economic opportunities outside, with religious beliefs and attachment to place sometimes off-setting the perception of climate risk. Similarly, in research on the Sahel, Nielsen and Reenberg (2010) note how the livelihood transformations in communities such as a move away from agriculture, changed cropping practices, and out-migration have been determined by a range of historically specific political-economic and social processes, although climate change sets the context in which these adaptation strategies become necessary in the first place (Nielsen and Reenberg, 2010).

This calls for a new approach to the political-economy of vulnerability. In this study from Nepal and India, the social and economic impact of climate change will be understood not in isolation, but as a 'conjuncture' or combination of circumstances, on an ecological, economic and political level. The Althusserian tradition of political economy sought to understand the complex means through which the multiple processes of the social whole are constituted by each other. This entails analysis of economic, political and ideological processes operating at multiple scales (Althusser, 1969). Bois' (1984) historical research on agrarian change in medieval Normandy was an important continuation of this tradition, yet it also engaged with climate as a driver of change. Although not central to the analysis, he explored how the transformation of the feudal system and its social relations was mediated by a combination of not only economic and political events, but meteorological shifts, which affect demographic and agricultural processes.

This paper therefore takes a holistic approach to contemporary climate change and gender. Both climatic and political economic pressures are understood as external drivers, which in combination with local level social structures and processes, create new patterns of vulnerability. Many of these local level social structures and processes (class relations, actions of the local state, migration patterns) are in turn connected to macro-level political-economic drivers.

4. MATERIAL AND METHODS

Data was collected in a series of field visits to two districts in Nepal, Morang and Dhanusha, and one district in India's Bihar state, Madhubani. The three sites are located in within a 150km radius of each other yet represent different socio-cultural and political domains within the eastern Gangetic plains. Dhanusha in Nepal and Madhubani in Bihar are both situated within the heartland of *Mithilanchal* a region which spans both sides of the Indo-Nepal border and shares a common linguistic (Maithili) and cultural heritage (see Figure 1). While these regions have a similar social structure, by including regions on both sides of the border, the impact of quite different institutional and political contexts could be assessed. The third district, Morang, also within Nepal, is just east of the Koshi river at the fringes of *Mithilanchal*. The study communities differ from Dhanusha and Madhubani in that they are predominantly home to indigenous tribal or *adivasi* populations with a quite different social structure and history of subordination to other ethnic groups of the region.

Figure 1: Map of field site



In Madhubani, Bhupatti and Rakuwari Panchayats (local unit of governance in India) which were selected for analysis, lie in a remote region of the district to the east of the Kamala river. Both include significantly sized core villages, with a number of satellite hamlets. In Dhanusha, Thadi-Jijha VDC (the local unit of government in Nepal) was selected. They are situated further north on the Nepal side of the border just west of the Kamala, and are composed of two primary settlements, the large mixed caste village of Thadi and its more remote neighbor, Jijha, with a *Dalit* majority. Ekrahi VDC lies to the north of here, and includes three medium sized settlements with a mixed caste composition. East of the Koshi yet within Nepal, three VDCs from Morang, Jhorahat, Bhaudaha and Thalaha were selected. They are composed of relatively small mostly *adivasi* and *Dalit* villages spread out across the plains to the east of Biratnagar city. Qualitative data was also collected in Haraicha VDC, slightly further north. All villages were within the same corner of their respective district.

To gain background information into the socio-economic dynamics of the communities, a randomly sampled survey was carried out for 5% of households in Dhanusha and Madhubani villages. A larger survey of 15% of households was carried out in Morang. This was because the villages were much smaller in size, and a larger sample would help ensure the sample was representative. Respondents were selected randomly, using a map of numbered households as a sampling frame in Morang and Dhanusha, and a village list supplied by the village Panchayat (local government) in Madhubani. The entire Panchayat was sampled for the Madhubani sites, and the entire VDC was sampled for the Dhanusha sites, while only selected wards were sampled for Morang, given the considerable geographical dispersion of settlements.

A series of qualitative household interviews were also carried out with both men and women in each community in several extended visits between Nov 2012 and July 2013 (see Table 1). This formed the core source of data. To begin, a series of 'gatekeepers' were appointed in each community, who facilitated the organization of interactions. These included social mobilisers for local NGOs with whom the research team had consulted with, farmer group members, or contacts of the research team from previous assignments. This was made easier in Nepal as the team had worked extensively in the selected districts of already, and thus had a good pre-established network on the ground. The second stage involved the selection of respondents. Respondents from different socio-economic and gender groups were introduced to the team by the gatekeepers and invited to participate, although further participants were engaged through a 'snowballing' technique, whereby initial households we interviewed would in turn introduce us to other potential respondents. Efforts were made to interview women and men from a range of socio-economic backgrounds and ethnic groups, and the team would regularly review the data ensure that a range of perspectives from different groups were being captured. Interviews were usually conducted in the courtyards of respondents' homes. A rough interview guide was used to ensure all relevant topics were covered, with one member of the team taking notes and another leading interactions.

Focus groups were also carried out to give a group perspective, using a similar question guide as was used for the individual interviews, although some PRA tools were added such as community timelines and mapping (see Table 1). Participants were invited with the support of the gatekeeper, and where possible, neighborhoods with different caste composition were selected. Male and female meetings were held separately, although separation was sometimes difficult to manage. Some individual and group interactions (note captured in Table 1) were more informal in nature, and emerged through spontaneous interactions with respondents in tea shops, during village social events, or while conducting field observations at sites of interest such as irrigation systems or markets. These often prove valuable sources of information, and helped to ensure that interactions were not limited by the networks of the gatekeeper. All interviews and questionnaires were conducted in Nepali, Maithili or Hindi. Finally, the research team had worked extensively in the selected districts of the Nepal Tarai already, and the lead author had been working in one district intermittently for several years, and insights from numerous past studies in the region (see for example, Sugden, 2009, Forthcoming; Sugden and Gurung, 2012) were used to help understand the social processes which were observed in the field, and to expand this case study.

Table 1: Interviews, focus groups and quantitative surveys carried out by district

District	No of interviews	No of focus groups	No of quantitative surveys
Dhanusha	20	4	133
Morang	26	2	123
Madhubani	20	4	171
TOTAL	66	10	427

5. POLITICAL-ECONOMIC TRAJECTORY OF STUDY COMMUNITIES

The three sites both fall within the greater Mithilanchal region, spanning the Nepal-India border. To understand contemporary patterns of vulnerability it is necessary to appreciate the historical context. The region was known in religious texts to be part of the ancient kingdom of Mithila, ruled by the Vaidehi dynasty at the time of the Hindu epic, the *Ramayana* (Burghart, 1978), and it fell under numerous larger centralized kingdoms in subsequent centuries. The region was thought to have been divided into two halves corresponding with the present day Nepal-India border under the Karnatas of Mithila between the 9th and 12th centuries (Chaudhury, 1964). Madhubani, on the present day Indian side of the border, was under the rule of the Mughals between the 11th and 14th centuries, and later was part of the Hindu Darbhanga Raj, a tributary state of the Mughal and then the British colonial authorities (Chaudhury, 1964). The state tax collection apparatus under the pre-colonial and colonial zamindari system, combined with a rigid caste system, saw the development of a hierarchical agrarian social formation.

The Nepal side of the border was known in legends and oral histories to have been partially depopulated after the collapse of the Vaidehi dynasty. Aside from some small Hindu and tribal chieftaincies (Burghart, 1978), the region was only extensively resettled from the 17th century onwards with the emergence of the first centralized state formation, the Sen Kingdom, which encompassed Morang and Dhanusha. This was followed by the Gorkhali dynasty, the founders of the present day Nepali state in the late 18th century. The expansion of these states culminated in the clearing of jungles (Sugden, 2013). In Dhanusha, the existing population of Hindu castes was expanded with migration from the south to clear the new lands (Gaige, 1976). The enforcement of a tax collection system similar to the zamindari system of India, the distribution of land grants, and pre-existing caste hierarchies ensured that the rural social structure converged to one very similar to that in other parts of Mithilanchal further south (Sugden, forthcoming). Morang was the most heavily forested region and was home predominantly to tribal or *adivasi* shifting cultivators. These communities were gradually subordinated to centralized feudalism as the state distributed land grants and undermined forest based livelihoods (Sugden, 2013). Inequality intensified during Nepal's Rana period in the 19th and early 20th century when the Tarai was a key source of revenue for the regime through agrarian taxation (Regmi, 1978).

By the end of the colonial period, an unequal tie of dependence between Nepal and India had become entrenched, retarding the growth of industry, backed up by the comprador interests of the ruling class (Blaikie et al., 2001). Economic growth in the Nepal Tarai remained limited aside from some limited industrial development in Morang, dominated by Indian capital (Sugden, 2013). In Bihar meanwhile, the highly uneven pattern of development within the skewed economy of post-colonial India itself (Kirk, 1981) saw Bihar emerge as one of the most peripheral states, with stagnant industry and a predominance of pre-capitalist agrarian relations (de-Haan, 2010), particularly remote regions such as Madhubani.

Today, all three study sites are economically peripheral and densely populated, while economic stratification within communities is deeply entrenched. In the Dhanusha and Madhubani field sites, the primary axes of inequality is between the larger land owning farmers and marginal owner cultivators and tenants at the base of the agrarian structure. Unless stated otherwise, 'farmers' when used throughout this paper refers not to male or female farmers per se, but to farmer households.

In Dhanusha, the largest owner cultivator farmers with more than 2 hectares represent only 9% of the total sample (see Table 2), yet they own 31% of the cultivated land. Aside from a small group of medium farmers and land owning non-cultivators, Table 2 shows that 67% of households in Dhanusha and 76% in Madhubani are either marginal owner cultivators with less than 0.5 hectares, landless labourers, tenants, or part-tenants (who own as well as rent land). Most of the marginal farming households also engage in agricultural labour to subsist. Wages on the land are low, and vary from \$1 to \$1.5 per hour, while many labourers are also paid in kind, usually 5-6 kilos of paddy.

In Morang, the large local land owning class is smaller and less powerful, with less than 2% of sampled households owning more than 2 hectares of land (see Table 2). However, at the top of the agrarian structure (and not included in the survey as they do not cultivate) is a powerful class of *absentee* landlords with vast estates cultivated by rent paying tenants. Many of these landlords are descendants of the feudal functionaries who were given forest land grants under Rana rule. The tenants form the base of the agrarian structure, with a significant 40% of households renting all or some of their land, and an additional 30% as landless labourers.

Table 2: Land ownership categories in sample from study villages

District		% part tenants	% pure tenants	% landless labourers	% 'small' owner cultivators with >0.5 hectare	% 'medium' owner cultivators with 0.5-2 ha	% 'large' owner cultivators with <2 ha	Local non cultivator with land
Madhubani	%	22.81	13.45	23.39	16.37	9.36	2.34	12.28
	n	40	22	40	28	21	4	16
Dhanusha	%	23.31	3.01	15.04	25.56	20.30	9.02	3.76
	n	31	4	20	34	27	12	5
Morang	%	22.76	16.26	30.08	12.20	13.01	1.63	4.07
	n	28	20	37	15	16	2	5

Caste is important in the reproduction of this agrarian structure on an ideological and political level due to the higher ritual status of dominant castes which justifies their control over land, and the historical role of state formations in favoring or discriminating against particular communities. Nevertheless, there are significant local variations due to historical differences in the relationship of certain castes to the state apparatus, with middle castes being part of both the dominant and subordinate class of farmers depending on the context. In the Madhubani survey, the traditionally dominant Brahmin's represent 71% of the large and medium owner cultivators, despite the fact they represent only a third of the sample. 31% of tenants, landless labourers and marginal farmers are from the low caste Dalit community, and 43% belong to 'middle' castes such as the *Yadav* and *Teli*, referred to in India as Other Backward Classes. In Dhanusha, the population of Brahmins is lower, while historically, middle castes played an important role in the feudal administrative hierarchy, and thus they are also important land owners. The middle castes and Brahmins together represent 71% of the large and medium owner cultivators, despite representing less than half of the sample. Just under half of marginal farmers, tenants and landless labourers are Dalits, with the remainder belonging to middle castes and the Muslim minority. In Morang, 77% of large and medium owner cultivators (representing just 14 households) are Brahmins from the hills, and the adivasi Tharu community, who traditionally had strong connections to the bureaucracy in the eastern Tarai. Two thirds of marginal, tenant and landless labourers are from *Dalit* communities and three traditionally marginalised indigenous groups the *Bantar*, *Rajbanshi*, and *Jhagar* who had gradually lost their land due to subjugation and indebtedness since the Rana era.

The primary forms of surplus appropriation within the communities which reproduce these inequalities on an economic level is rent on land, which is usually around 50% of the harvest, and to a lesser extent, low wage labour for richer farmers. Despite the presence of wage labour, there is limited evidence of capitalist

differentiation, and production relations appear predominantly semi-feudal in character (see Bhaduri, 1973). Even amongst the rich farmers, rent is used predominantly for consumption purposes, and there is little evidence of significant investment in technology and the expansion of holdings. There are other forms of surplus appropriation from the marginal farmer, tenant and laboring class, the most notable of which is usury. There are high levels of indebtedness. Loans are taken to pay for fertilizer or seeds before planting, to meet short term consumption needs, and to meet large one-off expenses such as marriages or payments to a middleman to facilitate migration of a family member. The survey for example revealed that landless labourers in Dhanusha owe on average NPRs 129,000 (\$1290) to private lenders, tenants and part-tenants owe NPRs 121,650 (\$1200), marginal owner cultivators (owning less than 0.5ha) owe NPRs 83,133, (\$830) while larger owner cultivators (owning more than 2 ha) owe just NPRs 62,000 (\$620). Interest rates are exorbitant, and farmers reported rates of around 36%, which appeared fairly standard for private loans, although interest reportedly can increase to half the value of the loan if the borrower needs money urgently or lacks bargaining power.

Class relations however, do not stop at the community itself. Out-migration and labour in the capitalist sector of towns and cities has been occurring for generations, echoing trends from across South Asia, a pattern documented in an earlier study in Morang (Sugden, 2013) whereby the pre-capitalist economic formation of the villages and the urban and industrial economy supplement each other in a classic articulation. Poorer farmers cannot subsist from the land due to marginal holdings and surplus appropriation through rent and usury, so work their own land (or others' as a tenant or labourer) to at least meet some of their minimum grain needs, while seeking further work outside to purchase additional food and make cash available to buy essential commodities. This dual livelihood strategy divides the risk for the farmer, while in turn ensuring a supply of low wage labour to the urban and industrial sector, which is in effect 'subsidised' by the pre-capitalist agriculture of the rural periphery.

With regards to gender relations, focus group discussions and PRS tools on gender roles with separate male/female groups, suggested that the primary axes of inequality is the gendered division of labour. In all three sites, women form the backbone of the agrarian workforce, taking control of the most labour intensive tasks such as paddy transplantation, weeding and harvesting. On top of this are extensive reproductive tasks such as child rearing, food preparation, and the collection of *gobar* (dung) for fuel from common lands or fodder for animals. Men traditionally take greater responsibility for tasks such as ploughing and preparing the fields and bunds, and are the predominant wage earners, although they play only a marginal role in reproductive activities. In spite of women's role in agricultural labour, men still make the primary decisions over how money is spent. Interviews revealed that women also earn significantly less than men, with men typically earning 50-100% more for work such as paddy transplantation, while men are paid up to three times more for exclusively male tasks such as ploughing. Furthermore, women still have unequal rights to property, aggravated by exclusionary national laws (Sugden and Gurung, 2012), with few having land in their own name. If there is no son, some interviewees even reported land being put in the name of the son in law, not the daughter.

6. CLIMATIC AND NON-CLIMATIC STRESS

6.1 EFFECT OF CLIMATE CHANGE

Interviews revealed that day to day climate stress is a reality for farmers, with a diverse impact on rural livelihoods in the study sites of the Nepal Tarai and Bihar. Assessing the dynamics of both historical and future climate change is a complex task given the regional variability within the Eastern Gangetic plains, the lack of high resolution data, and the inherent unpredictability of climate change outcomes. However, it is not the

intention of this section to chart the trajectory of climate change, but instead, to identify patterns of climate related change which farmers' perceive have affected their agricultural livelihoods over the last few decades.

Through a set of interview and focus group questions on changing weather patterns and agriculture over the last two to three decades, a set of broad changes were identified across all communities. One of the most notable observations was that there had been an increase in extreme precipitation events over the last two to three decades. Farmers associated this with increased flooding and waterlogging, which was a particularly acute concern by households along the Kamala river which flows near to the Dhanusha and Madhubani field sites. There were large floods in 1986, 1988 and 1988, 2002 and 2004, with 2008 being particularly severe. Farmers in Madhubani noted that low level flooding is necessary to replenish the soil, although larger floods can deposit high levels of sand and gravel, rendering land unsuitable for paddy cultivation, while ten years ago farmers in Rakuwari lamented how out of 200 acres of land was lost due to inundation by the river. In a similar flood five years ago, the residents of Jijha saw much of their land inundated with severe damage to the rice crop. An increase in flooding may parallel longer term trends. Jha and Tripathi, 2012, analysing meteorological data between 1871-2010 for India, point to a long term increase in rainfall in seven out of 12 months and a decrease during winter. Similarly, a medium term (1976-2005) analysis of weather patterns in Nepal (Practical Action, 2009) suggest that there has been an increase in rainfall in the eastern Tarai between 1975 and 2005 from 1 to 2mm per year in the pre-monsoon and post-monsoon periods and an increase of up to 10mm during the monsoon itself, with a marginal decline during the winter in some regions (Practical Action, 2009).

With regards to availability of water for agriculture however, an overall increase can be deceptive as it does not account for is the increased variability of rainfall, including an increase in prolonged dry spells (Bartlett et al., 2010, Sharma, 2009), a critical issue raised by farmers across the three sites. Focus group respondents in Bhupatti of Madhubani recalled significant droughts in 1990, 2000 and 2012, and in Dhanusha respondents also recalled a large drought was in 1992, with a these event occurring more regularly over the last five years. In the recent 2012 drought, there was reportedly a 70-75% loss of rice, and 60-65% loss of wheat in Bhupatti. Farmers themselves perceived a link between flooding and droughts, and some focus group respondents had correctly predicted a series of droughts following the 2008 floods. A study in Nepal by WECS analysed meteorological data to suggest also that an increase in intense precipitation over recent decades has been paralleled by a lengthening of dry spells (WECS, 2011). For most respondents however, drought events did not necessarily translate as a weak monsoon or a seasonal shortage of rain, but an increased unpredictability, with rain often coming later than expected when compared to 2 decades earlier, affecting the rice transplantation. Bearing in mind the presence of local variation, a state wide study by Jha and Tripathi (2012) of historical meteorological data (1871-2010) for India for example, suggests that in Bihar there has been an increase in rainfall in July yet a decrease in the other key monsoon months of June, August and September, suggesting that farmer concerns may parallel longer term trajectories.

A corollary of late monsoon rains was a perception that unseasonal rains during the Spring had increased in recent decades. In Morang in particular this was perceived as a constraint to wheat production as Spring thunder storms damage the crop around harvest time causing it to rot and lose its value. Increasing Spring rain was also identified as a long term trend in the study by Jha and Tripathi from India, and a medium term analysis of climate change in Nepal by Practical Action (2009).

Other changes reported by farmers include an increase in summer and monsoon temperatures which were reported in all three sites to have increased the levels of pest infestations of the rice, wheat and vegetable crops. This parallels analyses of climatic trends across India (bearing in mind local variations), whereby between 1901 and 2009, annual mean temperature have been shown to have increased by 0.56°C, and have been above normal since 1990 (based upon period from 1961-1990) (Sharma, 2009). The study by Practical

Action (2009) similarly suggested there had been an increase in mean maximum pre and post monsoon and monsoon temperatures across the Nepal Tarai from 0.02 to 0.04°C per year between 1976 and 2005.

A final concern raised by farmers was of an increased frequency of cold spells during the winter. At the time research was being carried out Madhubani and Dhanusha suffered two severe cold snaps in early and late January respectively, affecting winter vegetable production. In Thadi it was recalled it had damaged potato, cauliflower, brinjal, spinach crops. The fog and moisture in the air during the cold spell was reported to have caused the vegetables to rot. The villagers of Bhupatti had planted moong dal but it was ruined because of the cold, causing them to feed it to the livestock. This is backed up by meteorological data analysed by Practical Action (2009) for the Tarai, which suggested that there have been a significant drop in winter maximum temperatures in the plains by up to 0.02 °C per year (Practical Action, 2009).

6.2 OTHER CHANGES IN AGRICULTURE

It is crucial to note that climate is not the only driver of change. Within the study communities a broader set of challenges face both women and men farmers, from different socio-economic groups – creating more complex patterns of vulnerability. Firstly, the expanding cost of inputs such as diesel and fertiliser has put considerable strain on agriculture. The price for diesel increased by 352% between 1995/96 and 2009/10, simultaneously impacting the price of fertiliser (Pant, 2011), this is aggravated in Nepal due to dependence on India for all its imports. At the time of research Nepal had also been suffering from crippling fertiliser shortages at the key paddy planting season. The lack of subsidies for fertiliser or irrigation equipment, driven by pressure from donors pursuing a neo-liberal agenda, has also put Nepali farmers at a distinct disadvantage in global markets (Sugden, 2009).

Secondly, inflation means that marginal farmers and landless households once dependent in part on agricultural labour, are no longer able to subsist on the wages that they depended upon in the past. While women continue to work for other households, male household members in particular, are increasingly seeking work outside of the sector, a topic which will be dealt with in more detail later in the paper. In this context, households are unable to find labourers for traditionally male tasks such as ploughing. The alternatives meanwhile (e.g. using tractors) are expensive due to high fuel costs. The rising cost of living was cited by farmers to be linked to consumer grain prices in particular. The prices of grain staples and vegetables in Nepal has nearly doubled between 2000 and 2010, a trend which has continued for the last 40 years, while per capita GDP has only risen at a modest rate, from \$157 in 1981/2 to \$559 in 2009/10 (Pant, 2011). This is due again to high oil prices, which in turn increase the costs of diesel for irrigation or ploughing, and fertilizer, as well as the costs of food processing (e.g. rice milling), diversion of farmland to commercial and residential purposes, hoarding by traders, and climate change itself which has contributed to reduced harvests (Pant, 2011). In this context, larger labour employing farmers can no longer find labourers willing to work on their land at wages that would give them a suitable return. Even when labourers are paid in shares of rice, as is common in Dhanusha, farmers have additional cash expenses to meet, and this is rarely sufficient to subsist.

With regards to Bihar, very similar concerns regarding the cost of labour, fertiliser and diesel was also raised as by farmers during interviews. Kishore's (2004) study on agrarian change in Bihar points to a similar pattern of agrarian stress, also emphasising the high costs of these essential agricultural inputs, which are aggravated by inadequate producer price support and declines in subsidies. In all sites, large and small farmers lamented what was perceived to be a terms of trade stacked against agriculture, which is undermining the profitability of large farms, and the capacity of marginal producers to meet their subsistence needs.

Finally, a combination of state and national level political instability and neo-liberal restructuring has led to the emergence of state development institutions which are increasingly weak, with limited dissemination of new agricultural technologies (Sugden, 2009). Economic restructuring and pressure to reduce fiscal deficits has

reduced government investment in agricultural service centres, particularly in Nepal. District agricultural staff who were interviewed as part of an earlier study in Morang (see Sugden, 2009) complained of how the number of service centres had been cut by more than half, and remaining village level extension staff were overworked with low morale. In interviews, farmers displayed limited faith in the capacity of the local state to deliver basic agricultural services. Across Nepal, the vacuum created by economic restructuring has been filled by a plethora of NGOs, which in many cases lack coordination and are limited in geographical scope (Blaikie et al., 2001).

In Bihar too, the extent of agricultural extension services at a ground level in the Madhubani field sites appeared to be very limited. There were widespread reports of local state development schemes at a Panchayat level being undermined by corruption and siphoning of funds by local land owning elites. Furthermore, Bihar is still recovering from what Kishore (2004) refers to a 'decapitalisation' of rural areas between the 1980s and 1990s, with limited public capital formation and a collapse of infrastructure. Investment during the period was restricted primarily to expanding the use of tube wells and pump sets, but not on physical or market infrastructural development and electrification which would have decreased the costs of production.

7. CLASS, GENDER AND VULNERABILITY

7.1 CLASS BASED ADAPTATION AND MIGRATION AND MIGRATION

The widespread and overwhelming perception amongst respondents was that there was little future in agriculture, and that over the last decade or two, the odds have been stacked against them in every stage of the production and marketing process. To understand the impact of this set of climate *and* non-climate induced stresses on gender relations, it is necessary to look at the diversity of adaptation strategies followed by differently situated farmers at a *household* level. While the stresses outlined above impact both large and middle farmers, and the marginal and tenant farmer class – significant differences can be observed in the adaptation strategies pursued.

For large farmers, a first adaptation strategy involves altering the relations of production. A number of large farmers interviewed stated that they preferred to give some or all the land out to tenants nowadays rather than cultivating the land themselves. This explains the presence of local non-cultivators in Table 2, whereby up to 12% of respondents in Madhubani were non-cultivators with land, of which some had substantial holdings. In some cases, these included households where male family members had well-paying employment outside or locally, and giving land out to tenants allowed women to focus on activities within the household. In Madhubani and Dhanusha, there is also a tradition amongst some high caste Brahmin households (who represent some of the wealthier land owners, and more than half of the large cultivators in Madhubani) to not labour on the land themselves for reasons rooted in ritual and caste status, but to give the land to sharecroppers. However, even out of those still cultivating, a third of 'large' farmers with more than 2 hectares across all three sites were renting out at least some land. This not only saved the cost of paying wages and investing in irrigation or equipment, but it also ensured that the risk of any climate induced shock could be passed on to the tenants who have no choice but to rent land in order to meet their minimum subsistence needs.

It is however, more common for large and some medium farmers to pursue a second adaptation strategy, allowing them to continue direct cultivation. This is the investment in technology to improve per hectare productivity. The limited state extension services mean that investment is primarily in high value, yet well-established heavy machinery. These include labour saving technologies such as threshers and tractors, which can also be rented out to more marginal farmers, offering an additional source of surplus. The most critical

asset however, is pumping equipment to extract ground or pond water and investment in a shallow tube well. While this cannot protect farmers from the risks of floods or rising temperatures and increases already high labour and diesel costs, it is crucial for them to reduce the risk of droughts or late monsoons by providing water 'on-demand', something which is impossible when relying on rain, or the few perennial canals which were in a state of disrepair.

For the marginal farmer and tenant class however, the range of adaptation options is more limited – reminding one that vulnerability is deeply embedded in social structures. Marginal holdings and surplus appropriation through rent and usury mean they are not only more vulnerable in the first place to subtle changes in the climate on a year by year basis, but the available cash to invest in irrigation is also far more limited. Many farmers are not even meeting their subsistence needs on their land, let alone having sufficient capital to invest in a tube well or pumping equipment. Table 3 shows that with the exception of one part-tenant household in Morang, the few tube wells which are owned in survey sample belong to large owner cultivators, who represent a tiny minority.

Table 3: Proportion of households with tube well

Farmer category		Morang	Dhanusha	Madhubani
part tenant	%	0	7	3
	n	0	2	2
pure tenant	%	0	0	0
	n	0	0	0
Small owner cultivator (<0.5)	%	6	0	0
	n	1	0	0
Medium owner cultivator (0.5-2)	%	0	32	0
	n	0	8	0
Large owner cultivator (>2)	%	NA*	17	50
	n	0	2	2

* As there are only 2 large owner cultivators in the Morang sample, it is not possible to make any concrete conclusions on the basis of data for this category.

Even if cash is made available through loans or outside sources, the constraints to investment are amplified if they do not have land ownership rights. Tenants have no incentives to bore a well on land which does not belong to them and could be taken away at any time by the landlord. This also impedes access to government schemes. In Nepal for example, the government provides a 100% subsidy to user groups for five shallow tubewells for each 12.5 ha of land. The subsidy is however only given to farmers who own land, have tenancy rights, and possess a citizenship card and recommendation from the Village Development Committee. However, most of the tenant farmers in all three sites rent land through verbal agreement and lack official tenancy papers. Even for those who own small plots of land, particular constraints are faced by poorer women headed households whereby they may not have citizenship (see below), or the land may be in the name of an absent male, as McCarl (2013), found in an associated study of groundwater use in Morang and Dhanusha district. Caste is also an impediment which was brought up in interviews. Dalits noted how they were often rarely consulted in public information campaigns, and had little awareness of which government programmes were available, and how to benefit from them.

The landlords often have little interest in investing themselves, especially if they are absentee, as is common in Morang. Table 3 shows that no pure tenants and only a small proportion of part tenants own tube wells. With regards to pumping equipment, which can also be used to take water from streams or ponds, ownership is

similarly skewed. Figure 2 and Figure 3 show that most pump sets in Dhanusha and Madhubani are owned by medium and large owner cultivators.

The remaining option for marginal farmers is to *rent* a pump set and/or tubewell. Figure 2 and Figure 3 show that a significant percentage of respondents from all farmer groups in Dhanusha and Madhubani who don't have their own pumps or wells rent equipment. It is lower in Morang due to the availability of canal irrigation (see Figure 4). Renting equipment is considerably more expensive than operating one's own pump set, as the hourly payment offers an additional 'rent' for the owner. Although even the poorest cultivators must use the water market in to meet their subsistence needs, it is this group that faces the greatest economic pressure, particularly those giving away much of their harvest as rent. The price of renting pumping equipment is reportedly amplified by local monopolies, particularly when there is limited choice of water sources, and source owners are also the pump owners (see Wilson, 2002). Furthermore, with rising diesel costs, the price of pumping has more than doubled in the last 10 years. Pumps are often only used by poorer farmers to irrigate the rice crop during monsoon dry spells, and they are less likely to use them for dry season cropping. The survey for example showed that in Dhanusha in the last year, only 9% of tenants and part tenants grew wheat, a crop dependent upon plentiful pump irrigation, as opposed to 26% of medium and large owner cultivators. In Madhubani this stood at 52% and 75% respectively.

Figure 2: Ownership and use of pumping equipment in Dhanusha

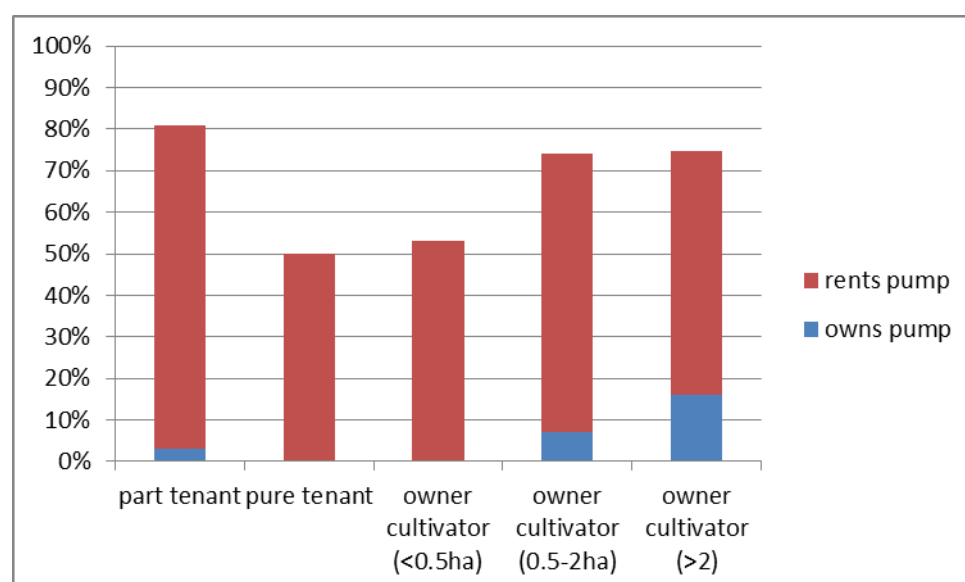


Figure 3: Ownership and use of pumping equipment in Madhubani

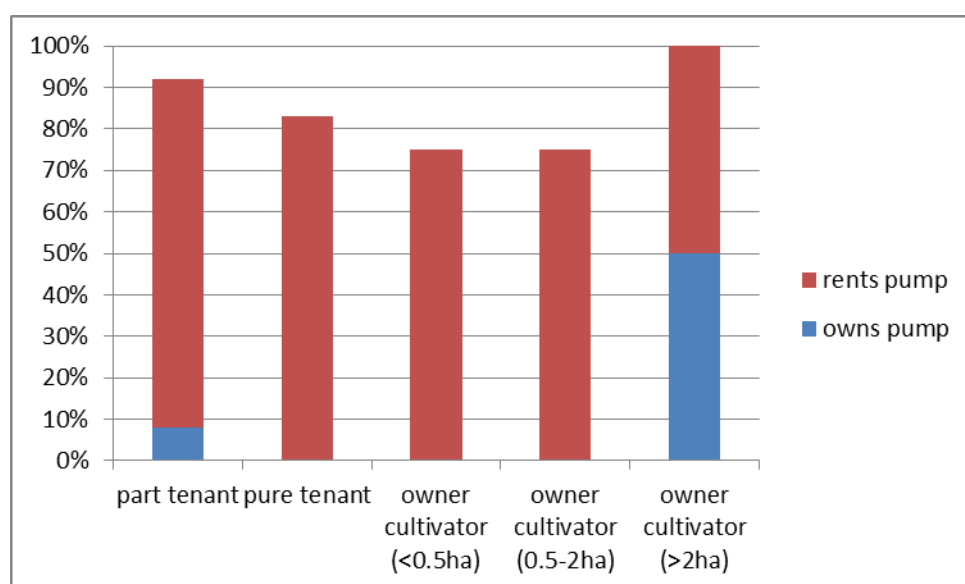
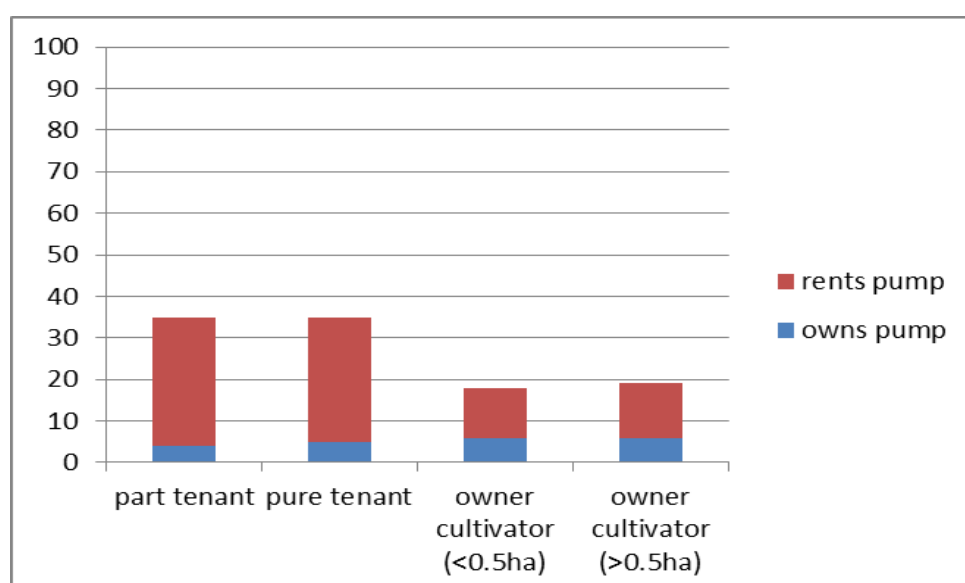


Figure 4: Ownership and use of pumping equipment in Morang



For most marginal cultivators however, by far the most significant adaptation strategy is to diversify their livelihoods through *increasing* the engagement of male household members in wage labour. While this is a long established pattern, what is different today is that the demand for non-agricultural labour is increasing dramatically in the context of rising input costs and climatic stress. For example, one farmer from the *Bantar* community in Morang's Jhorahat village recalled how he had been farming his land on a fixed rent contract from an absentee landlord, who demanded a 20 *maund* (800 kilo) share of paddy. Due to the late monsoon in 2012, the farmer reported that his rice harvest was itself just 20 *maund*, all of which was given as rent. A season's labour and expenditure on the farm was wasted. He had already taken a loan to invest in fertiliser. At the time of research he was urgently seeking non-farm labour to repay the debt and provide food for his family. Similarly, in the *Chamar* (a *Dalit* caste) settlement of Bhupatti in Madhubani, where most farmers were

tenants, few could afford pump sets, so they suffered from the same failed monsoon and now seek menial labour locally to buy rice.

Demand for off-farm labour is also increasing given the rising cost of living which is making agricultural wages on the land of large farmers unviable to survive. In addition, respondents in Madhubani noted how there was increased pressure to spend money on consumer goods such as new clothes or saris. In all three regions, the cost of weddings, associated gift exchanges and dowry, had risen considerably with an increasingly monetised economy. It is in the context of rising costs alongside agrarian stress that farmers choose to combine tenancy or the farming of marginal plots with non-agricultural employment. This echoes the research by Nielsen and Reenberg (2010) in the Sahel, whereby demand for cash for cultural as well as household economic purposes has been as important as climate change in driving a move into the wage economy.

A critical issue however is availability of work locally. In Morang, which is in the vicinity of many factories, competition for factory jobs is intense, and the severe levels of landlessness in the vicinity ensures demand even for casual labour in towns remains high. In Dhanusha and Madhubani which are significantly more remote, off farm labour opportunities are very limited, being restricted to construction work in local bazaars or brick kilns. In this context, marginal and tenant farmers are becoming more dependent than ever before on *migrant* labour. The vast majority of migrants are male, with the survey revealing only one female migrant each in Dhanusha and Madhubani, and three in Morang. The social changes male out-migration brings will be shown to be the *most significant* cause of gendered vulnerability in the context of climate change and agrarian stress

It is important to note that male labour migration has a long history in the study communities, particularly seasonal movement to Indian cities. Today however, it has reportedly increased dramatically across all three field sites. Seasonal migration is often intricately connected to climatic fluctuations. Dalit respondents in Jijha of Dhanusha reported that in a bad year they may go to Indian cities for many months, with even the older children leaving school join the migrant labour force. If the harvest is good they will go for a shorter period of just a few months. Some *Chamar* households in Rakuwari even reported that they preferred to leave the land fallow and migrate in the dry season due to declining water in ponds, rather than planting wheat as had been done in the past, a pattern of dry season disengagement from farming echoed in Morang in an earlier study (Sugden, 2013). Longer term migration, where the labourer lives for most of the year outside the year, may not fluctuate according to the harvest, but is associated with a broader trend of agrarian stress.

Overseas migration is a much newer phenomena, restricted to the Nepal sites of Dhanusha and to a lesser extent, Morang (see Table 4), where state policies and labour agreements have actively facilitated the migrant economy (Graner and Gurung, 2003). While the wages are not necessarily much higher than what is received through seasonal work in India (particularly when one considers the high levels of debt incurred to send family members abroad), it has the advantage of offering more regular employment. Farmers with family members abroad have noted how remittances have helped them in coping with droughts and other climate shocks.

While Table 4 suggests there are a greater number of migrants from poorer farmer categories, particularly in Madhubani, it is important to note that better off land owning households also have migrant family members. 58% of the farmers with more than 2 ha in Dhanusha have family members outside (see Table 4). However, none of these farmers engage in seasonal labour. Furthermore, sending a family member abroad is more often a supplemental form of income for these richer households, and they do not depend on the migrant remittances to the same degree as their poorer counterparts. The income overseas or in cities is often significantly higher as the migrants' work is often skilled or semi-skilled. In Madhubani, for many of the rich farmer households, family members outside are engaged in professional employment or education, and there were sometimes not even any recorded 'remittances' as extra money was not needed in the home.

Table 4: % of households with migrants from different wealth groups

Farm category	District		Proportion migrants	Seasonal	% Permanent migrants		
					Total proportion	Proportion of migrants in Nepal and India	Proportion of migrants overseas
Tenants or part tenants	Dhanusha	%	17		54	0	100
		n	6		19	0	19
	Morang	%	25		13	33	67
		n	12		3	1	2
	Madhubani	%	47		70	100	0
		n	24		18	18	0
landless labourers	Dhanusha	%	20		67	0	100
		n	4		13	0	13
	Morang	%	65		8	0	100
		n	13		3	0	3
	Madhubani	%	46		68	100	0
		n	20		13	13	0
owner cultivators <0.5ha	Dhanusha	%	21		44	5	95
		n	6		14	1	13
	Morang	%	47		13	0	100
		n	7		2	0	2
	Madhubani	%	30		30	100	0
		n	5		11	11	0
owner cultivators 0.5-1 ha	Dhanusha	%	11		43	0	100
		n	4		11	0	11
	Morang	%	38		25	0	100
		n	6		5	1	4
	Madhubani	%	20		33	100	0
		n	4		9	9	0
Owner cultivators >2 ha	Dhanusha	%	0		58	29	71
		n	0		6	1	5
	Morang*	%	NA		NA	NA	NA
		n	NA		NA	NA	NA
	Madhubani	%	0		50	100	0
		n	0		2	2	0

* No of large farmers in sample too small to be representative

7.2 MIGRATION AND INCREASED WOMEN'S WORKLOAD

Migration, although an essential coping strategy, has increased women's vulnerability in a number of ways. This can be considered an *indirect* impact of both climate and non-climatic change which has emerged through the process of adaptation itself. The primary challenge for women's wellbeing has been an increased workload. Out-migration has for generations been the domain of males. In Madhubani for example, 87% of permanent migrants and 99% of seasonal migrants in the surveyed households were male. In Dhanusha and Morang males constituted 98% and 99% of permanent migrants respectively, and all seasonal migrants. Most migrants are of working age, with most reportedly in the 20s-40s age range, although occasionally even younger males migrate, with some Dalit migrants to India in Thadhi Jihha reportedly in their teens.

There has in this context been a rise in women headed households, who constitute 23% of households in Dhanusha, 83% of which are from small owner cultivator (<0.5ha), landless labourer or tenant households, a phenomena repeated in Morang (see Table 5). In Madhubani 8% of households are women headed, of which two thirds are from the above three poorer groups. The over-representation of poorer households is likely to be because they are more dependent upon migrant labour, and thus send more family members outside to work, leaving only the women behind – reminding one of the role of class in shaping migration patterns.

Table 5: % Women headed households

District	% women headed households	% women headed households from tenant, landless labourer or small owner cultivator (<0.5ha) farm categories
Dhanusha	23%	83%
Morang	10%	83%
Madhubani	8%	67%

In this context, there is evidence that poorer women are taking on a new round of labour responsibilities alongside their existing productive and reproductive tasks. This was raised as a critical concern for women in almost all interviews. The increased workload is particularly high in households where men are away on a more permanent basis. In Dhanusha and Morang, respondents noted how they have to look after all the household works such as child rearing, established agricultural tasks such as paddy transplantation and harvesting, while taking on new agricultural tasks which were previously the male domain such as hiring and supervising labourers and negotiating the rental of a pump set, and cleaning out the irrigation canals. Some tasks such as ploughing are rarely done by women, and thus labourers have to be employed, putting financial stress on women left behind. In Morang, one respondent also noted how the increase in labour responsibilities had led to an increase in stress related health problems for women. This is not restricted to families with long term migrants, in Madhubani where seasonal migration is common, female respondents also noted concern as men were away for much longer periods than in the past.

The over-representation women headed households in the marginal, tenant and landless labourer categories, highlights the role of class in shaping the experience of migration for those left behind. Even for wealthier women whose husbands *have* migrated, they have a greater capacity to cope. A number of medium and large farmer households encountered in the field had sent migrants outside, but as noted above, the migrants usually had higher education, and by finding semi-skilled work, inevitably receive higher remittances. Women at home can compensate for a decrease in male labour availability by hiring workers from other households. In this context women's primary role outside reproductive work is to supervise the labourers but not actually labour themselves. Some households with larger land holdings even give it out to tenants, so the women left behind can subsist on the rent, and do not even need to supervise the farm production. This does not however apply to poorer households with migrant members, who often do not have sufficient cash income to hire workers (or sufficient land to rent out), causing the labour burden to fall on the women left behind.

7.3 DIRECT VULNERABILITY TO CLIMATE CHANGE FOR WOMEN WHO ARE LEFT BEHIND

Interestingly, while out-migration on a seasonal or permanent basis is an indirect consequence of both climate change and other political-economic stresses on agriculture, in many cases those who are left behind are subject to greater *direct* vulnerability to climate change itself. Firstly, in the case of extreme climatic events, it is often the poorer women headed households whose male members have migrated who are most vulnerable.

For example, respondents in Rakuwari and Thadi-Jijha recalled the Kamala river floods several years ago. The floods destroyed many homesteads. Some families took refuge in the homes of villagers residing on higher land, while others had to sleep outside. This was reported to have been particularly difficult for women whose husbands were not present at the time. Families reportedly slept in shifts for safety. At this time there was an increase in disease amongst old people and children, increasing women's already high labour burden as they cared for the sick. In the *Dalit* settlement of Bhupatti, it was noted how the increasing tendency for cold snaps during the winter has also increased health problems for dependent household members who need to be kept warm and well clothed, not to mention the women themselves who have to work long hours caring for the family.

Secondly, when male family members are away, women who remain in the household have to depend on their land and agricultural labour to support the family. While local off-farm labour is a possibility, many of these jobs are considered the male domain. When male family members do work locally in jobs such as rickshaw pulling or construction work, there will be a daily inflow of cash to the household. However, when they are working as migrant labourers, the income flowing back to the household is often sporadic, and those left behind (normally women) may wait for long spells between payments. Seasonal migrants can often only pass on their earnings after they return to the village later in the year, while for overseas migrants in Nepal there is sometimes no income for the first two years as they repay the extensive debts to money lenders which were incurred to migrate in the first place. During this period family members back in the village often receive no income.

During these interludes without income, dependence on the land makes such women and their children more directly vulnerable to climatic shocks such as droughts. This was notable particularly during 2012, when there was a 70-75% loss of paddy due to late rains, and 60-65% loss of wheat due to Spring thunderstorms. Later in the year during the winter dry season when many men had left for cities to labour, the stocks of grain were depleted. At this time, many women from marginal and tenant farmer households in Madhubani recalled how they had to engage in labour on the land of richer farmers so they could acquire food to feed the families, while simultaneously preparing their land for the next year's harvest. Insecurity was worsened by a downward depression on wages for women's agricultural work. Due to the drought the landlords were paying less. It was lamented in the *Dalit* settlement in Rakuwari how a landlord would offer work for four people but ten labourers would come to his house on the day, so work would be offered to whoever would accept the lowest rate. Women would earn as little as 4 to 5 kilos of paddy, equivalent to 30 to 40 rupees (\$0.5 – 0.6) to work for these rich farmers. Similar stories were repeated in the *Dalit* settlement of Bhupatti, where women recalled that the family nutrition is affected when labour is not available.

7.4 ADAPTATION FOR WOMEN LEFT BEHIND

In the contexts outlined above, the capacity for women to adapt to climatic and non-climatic shocks is often much more limited, particularly in the case of women headed households. While women have greater labour responsibilities following male out-migration they do not necessarily have improved access to finances, social networks and knowledge. Firstly, accessing capital necessary to pursue new livelihood activities can be challenging. In some instances women do not have access to the remittance money sent by their husbands. This was raised in Dhanusha and Morang in particular, whereby overseas migrants must transfer the money through the banking system. In some instances the money is collected and controlled by the in-laws, who collect money on the behalf of the household. Cross border marriage is widespread in Nepal, with Indian wives marrying Nepali citizens. The risks of losing access to remittances is high for newly married women who have not been able to acquire Nepali citizenship. Citizenship documents are reportedly necessary to collect money, and without them, husbands have to send it in the name of brothers or other family members. In the context of cross-border marriage in Dhanusha, it was reported that in-laws were sometimes reluctant to support the

preparation of Nepali citizenship papers until some years into the marriage, in case the wife absconds with the remittance cash.

The constraints in accessing capital to diversify their livelihoods is aggravated by the increased expenditure that women are expected to manage when male family members are away. A number of women in all sites noted concern about the high education costs they have to manage for their children. There was also evidence that migration was putting increased pressure on bride's families to provide high dowry. A group of women in Thadhi-Jijha noted how a trend has started whereby the husband's family asks for high dowry which is used to send him abroad. One girl who is in class 8 (aged 14-15) feared her imminent marriage, suspecting that she would be like a maid in her new household. She noted how the husbands often just return, make their wives pregnant, and then leave them alone to give birth and take up all the child rearing responsibilities, while giving all the remittances to their in-laws. She noted how such women have no assets in the case of a crisis, with their maternal families already having made huge expenditures for dowry.

Thirdly, accessing basic agricultural resources such as irrigation can be more difficult for women farmers whose husbands are outside, particularly when they have to rent pumping equipment and tubewells. Some women noted that they do not have the networks and contacts of their husbands and feel uncomfortable approaching male neighbours to request use of a well. This echoes findings in Mccarl's (2013) study in Dhanusha and Morang, which noted that women who actively engage with men publically in agricultural matters such as hiring labourers would be subject to harassment or 'gossip' by other community members. Only 36% of surveyed women headed households in Madhubani and 33% in Dhanusha had used a pump set in the last year to pump from ponds or tubewells. Pump set use for male headed households is 62% and 67% respectively. A women in Jijha village in Dhanusha noted how when the husband was in the village, they used to cultivate vegetables commercially. He would coordinate with neighbours to arrange the pipes and equipment for tube well irrigation and would go to the market to buy inputs such as pesticides and fertilisers. As nobody was there to manage these inputs after her husband migrated, she has abandoned vegetable cultivation and cultivates only paddy, wheat and *musuri* dhal. A household in Thadi nearby noted how they had also abandoned vegetable farming for the same reasons. In the same village it was noted that many women do not have the knowledge of government schemes such as the provision of subsidised tube wells to user groups, neither do they have the time to visit the government offices in the towns to process the paperwork.

As well as irrigation, accessing other agricultural inputs can be difficult when the on-farm division of labour is disrupted due to migration. A Khawas women in Haraicha of Morang noted how rising temperatures meant crop diseases had increased compared to the past, mainly for rice and wheat. She recalled how her husband used to deal with crop diseases when he was here, and she has no knowledge of the right chemicals to use. Productivity had decreased by 20 *maund* (80kh) on her 1.5 bigaha of land this year.

7.5 CLASS, ADAPTATION AND WOMEN'S VULNERABILITY

Masika (2002) questions the widely-held view that male out-migration makes women more vulnerable because in some instances it can give women greater decision making powers, and open up new livelihood possibilities for them. This was evident in some women headed households. Some women interviewed in Madhubani, Morang and Dhanusha noted that now they have to manage the farm, making them more active and empowered, with a richer agricultural knowledge. A number of women headed households had also set up small enterprises – mostly those near the home such as poultry farms and small shops which can be managed while also carrying out housework.

However, while migration has allowed a reconfiguration of gender roles and has opened up new opportunities for women to manage household finances, there is again, an important class dimension – whereby one's capacity to take up new livelihood opportunities is dependent upon one's position in the agrarian structure.

For example, a number of women from Tharu and related Khawas households in Morang have been able to take up a number of non-farm adaptation opportunities on their own in the context of climate induced stress in agriculture. One example was a Khawas woman whose husband was abroad in Qatar who owned 5 bighas (3.35 ha) of land – a relatively large holding. Production had declined, they had no tube well, and the harvest had suffered from the erratic weather of 2012. Now she has given the land to sharecroppers – passing on the risk, and has invested in a chicken farm using the money from her husband's remittances, offering a more secure source of income. Her husband has a semi-skilled job in a factory and is earning NPRs 35,000 a month. Not only was this household better off, it belonged to an adivasi community where women traditionally have a greater role in the public sphere, while the Tharu and Khawas themselves are one of the relatively better off and more politically connected ethnic groups in Morang district.

On the other hand, women from marginal and tenant farmers do not have the same opportunities. Often the remittances received are much lower, with menial labourers in Qatar earning just NPRs 18,000 per month, with few opportunities to corner some income to set up enterprises. A Dalit women in Bhuptatti of Madhubani noted that there are often no savings to manage on a day by day basis – whatever comes into the household is spent straight away when needed. Furthermore, as noted above with a reduced capacity to hire labourers on the farm, many women have far too high a workload to divert labour to managing an enterprise.

8. CONCLUSIONS:

This paper reminds scholars of the intersectionality of gender and class, and also of the fact that climate change cannot be understood in isolation of multi-scalar political-economic processes in constant interaction. Not only is livelihood change driven by a combination of large scale climatic and economic pressures, its impacts are mediated by local social structures, which are themselves shaped and reproduced at a higher level. In the case studies presented, social relations on the ground have been shaped by historically entrenched inequalities associated with the pre-capitalist social formation of the Eastern Gangetic Plains and a pattern of regional underdevelopment which has turned the region into a source of cheap labour, subsidised by pre-capitalist agriculture. These social relations have in turn been affected in recent years by climatic stress and economic trends associated again, with macro-level economic processes such as rising fuel and input costs. This has increased levels of out-migration and created new patterns of vulnerability which correspond to pre-existing gender class and caste divisions.

This also raises important questions about the strategies to facilitate climate change adaptation that are followed by governments and international bodies such as the UNFCCC at the international level and NAPA (GON 2010) and Climate Change Policy (GON 2011) at the national level. So far climate change adaptation discourse is focussed on technocratic interventions to respond to the proximate causes of vulnerability. While policies do increasingly engage with how social relations affect vulnerability, in the long term, the strategy for both policy makers and progressive social movements seeking climate justice must move towards addressing inequities at a much broader scale, in other words, what Basset and Fogelman (2013) 'transformative adaptation'. On one level, policies or government strategies can address short term proximate causes of stress, for example improving access to irrigation, providing subsidies for agricultural inputs to reduce the risk involved in agriculture. However, in the long term, it is necessary to transform the social structures at multiple scales which lie at the root of vulnerability. These could include for example, land reforms to dismantle pre-capitalist inequalities, and experimenting with new social relations of production such as cooperative farming. At the same time, there is a need for meaningful efforts to improve the status of women through for example, their engagement in the bureaucracy at multiple scales, and an end to discriminatory laws. Finally at a larger scale, challenges remain in the identification of new trajectories of national economic development which reduce regional uneven development which has distorted the economy of the Eastern Gangetic plains for decades, and has perpetuated the low wage migrant economy.

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